KLIMAIRE®

SERVICE MANUAL

KLIMAIRE AIRCONDITIONER

KSIM DC INVERTER MULTI TYPE

KSIM20912-H216
KSIM30912-H216
KSIM40912-H216

DC MULTI OUTDOOR UNITS

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1. General information of Outdoor Units

Model name	Dimension (mm)	Net/Gross weight (kg)	Compressor
KSIM20912-H216	845x320x700	53.5/57	DA130S1C-20FZ
KSIM30912-H216	845x320x700	57/60.5	DA150S1C-20FZ
KSIM40912-H216	990x345x965	86 / 90	TNB306FPGMC-L

2 Features

Outdoor unit

Power relay control

Low noise air flow system

Hydrophilic aluminum fin

The hydrophilic fin can improve the heating efficiency at operation mode.

4 way valve control

It is only operated in the heating operation mode except defrosting operation.

Anti-rust cabinet

Valve protection cover

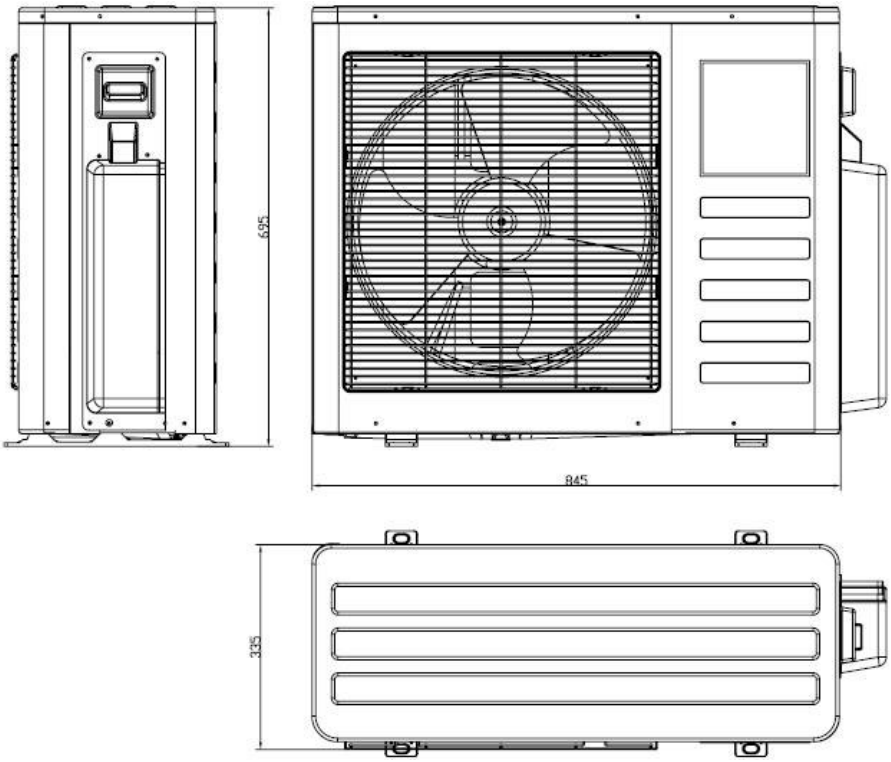
It protects the valves and prevents water from dripping.

Discharge pipe temperature protection

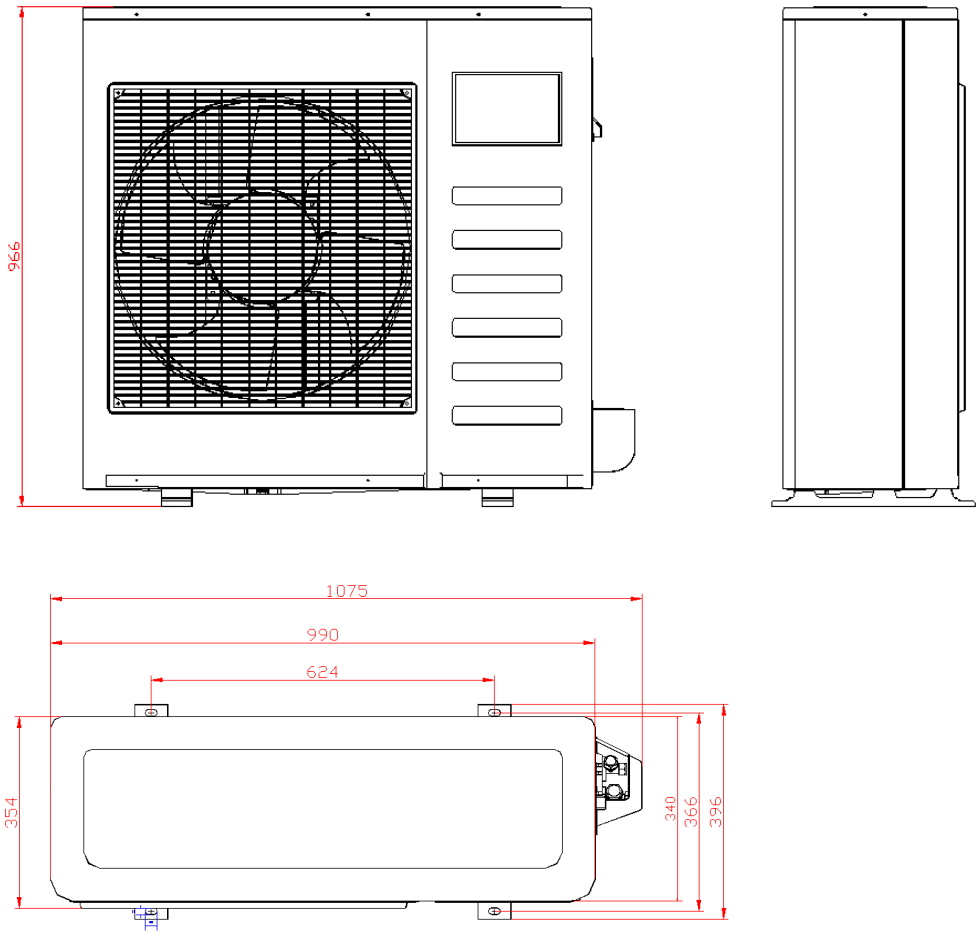
Compressor crankcase heater

3. Dimensions

a) KSIM20912-H216 KSIM30912-H216

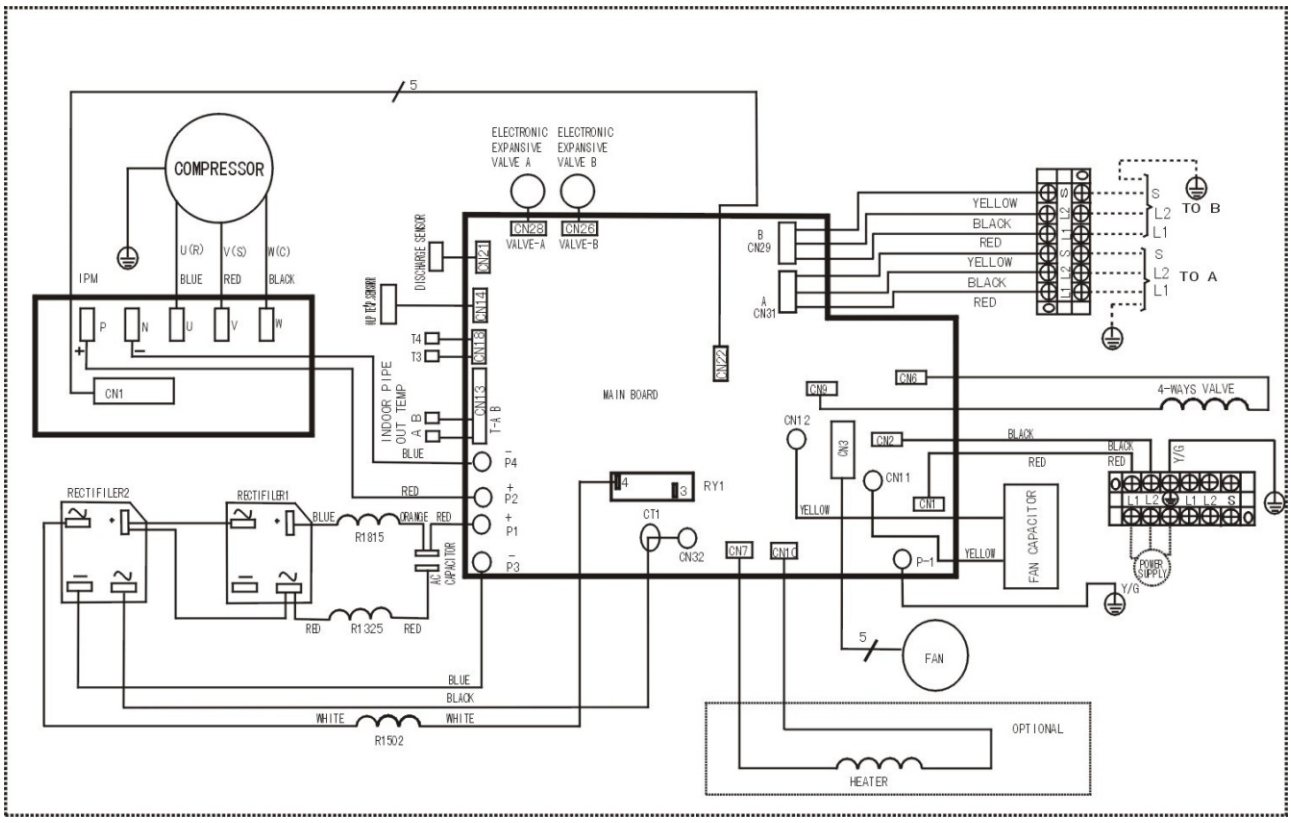


b) KSIM40912-H216

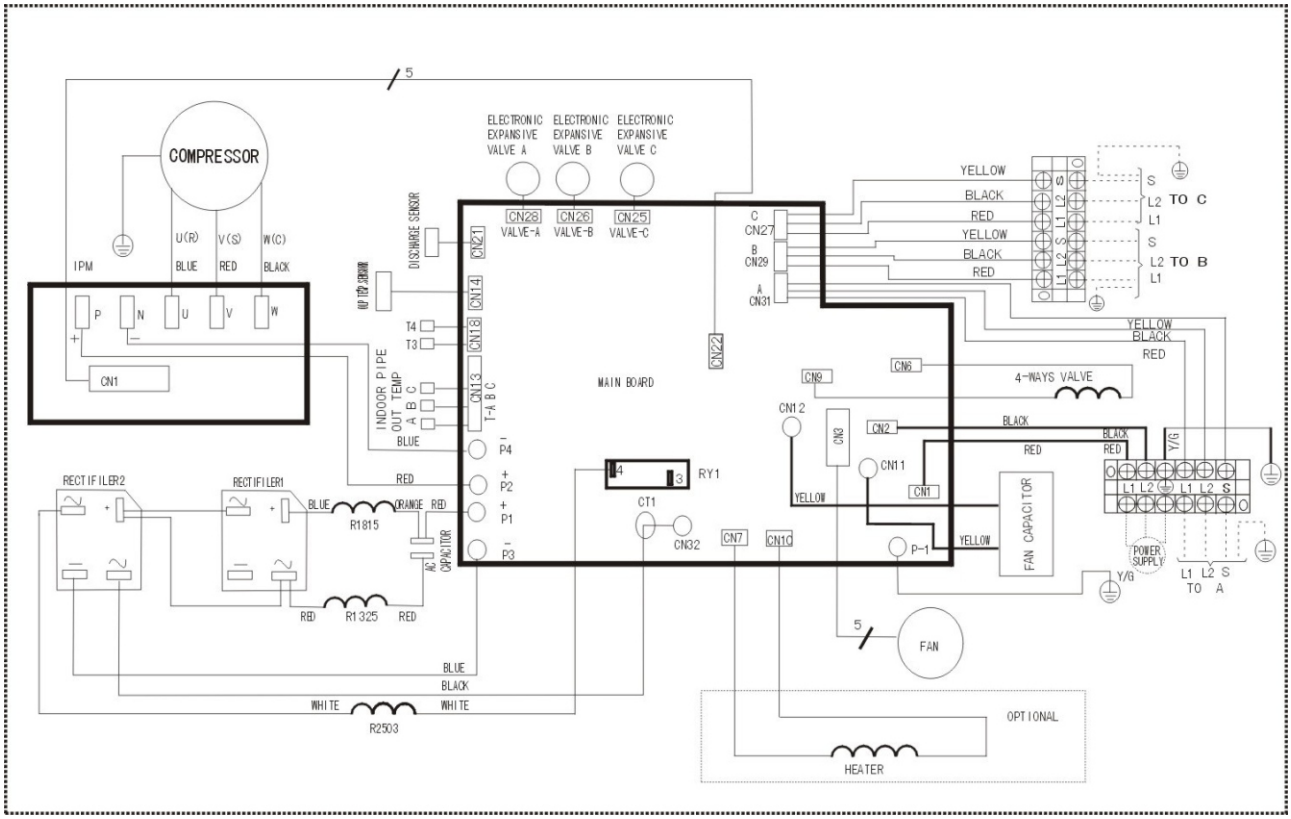


4. Wiring Diagram

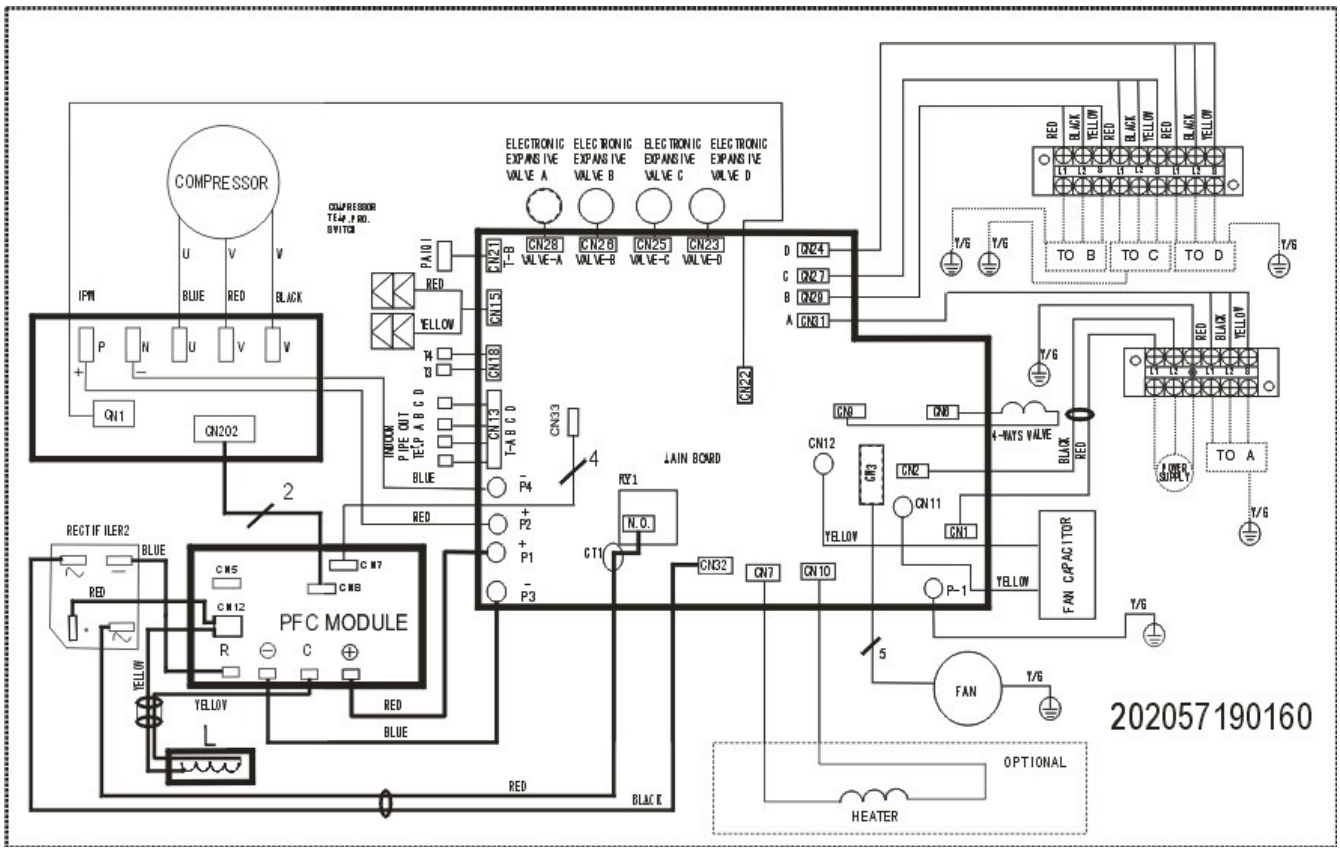
4.1 KSIM20912-H216



4.2 KSIM30912-H216

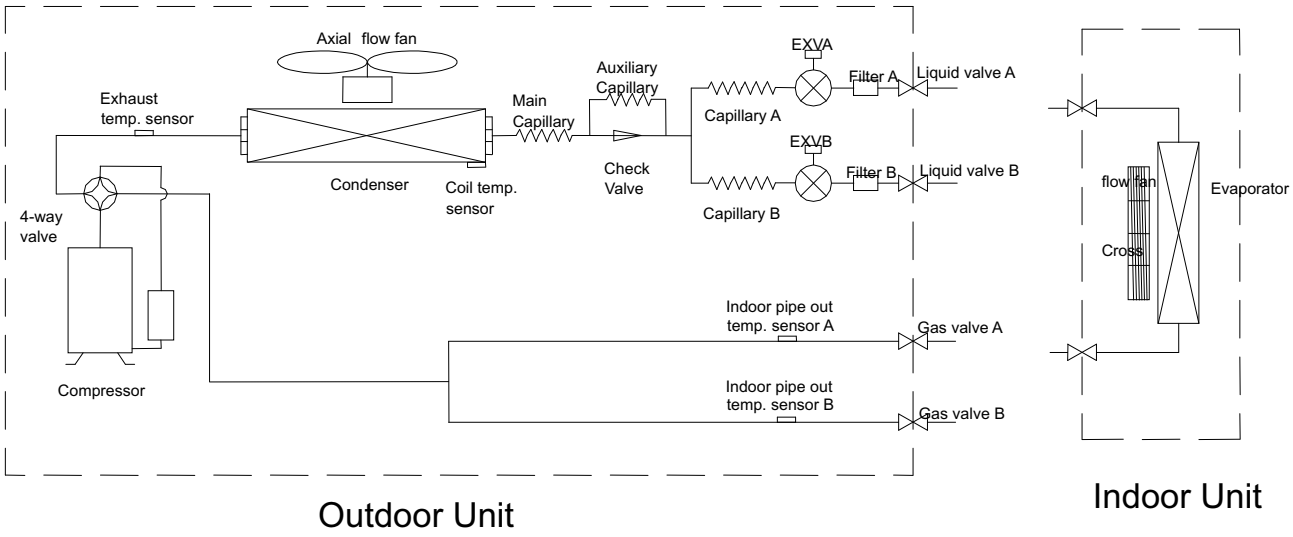


4.3 KSIM40912-H216

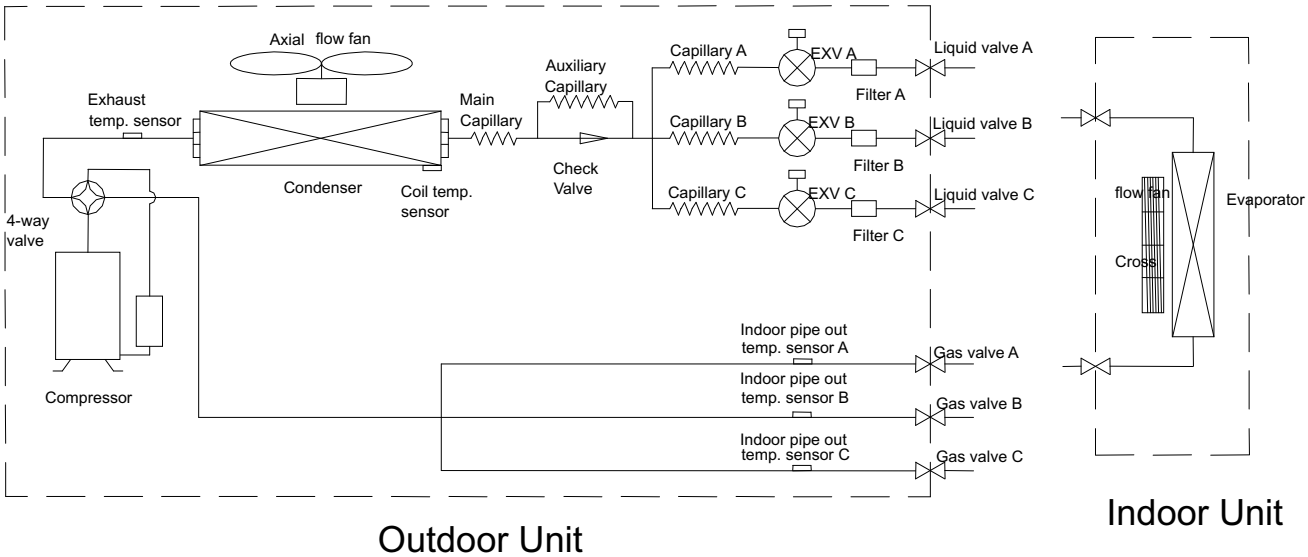


5. Refrigeration Cycle Diagram

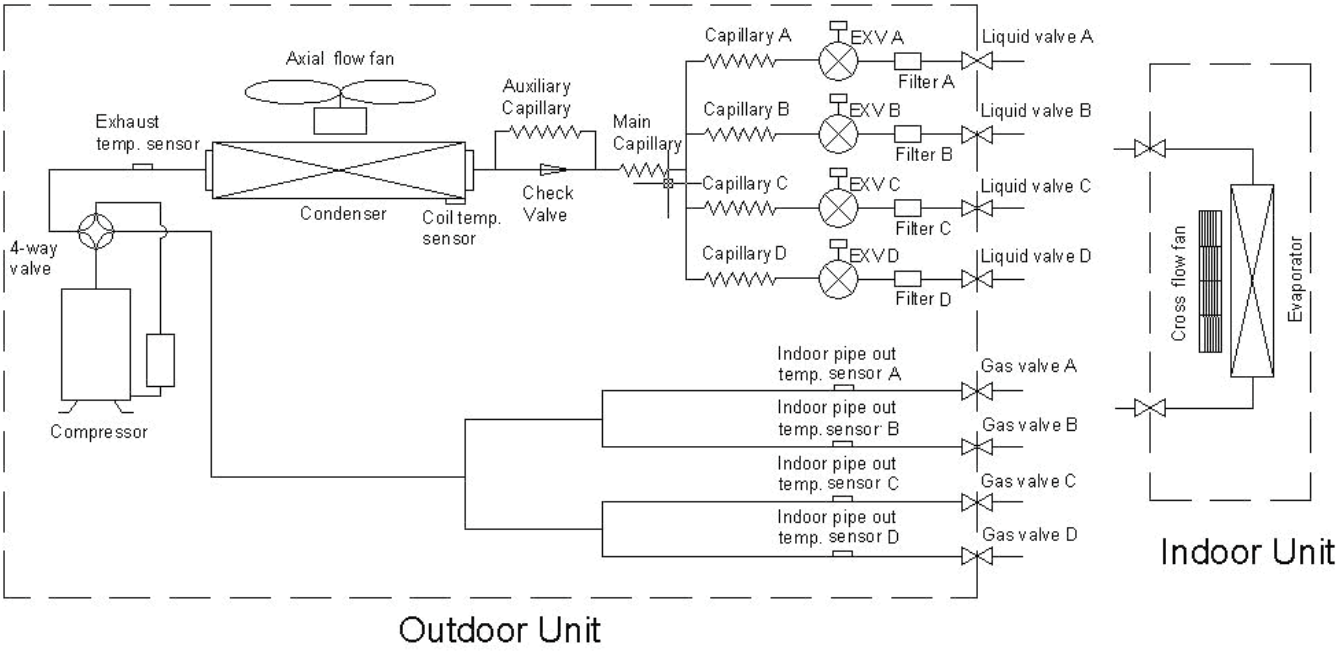
8.1 Refrigeration circuit drawing of inverter binary type



5.2 Refrigeration circuit drawing of inverter trinary type



8.3 Refrigeration circuit drawing of inverter quadplex type



6. Indoor units combination

6.1 Indoor unit combination for KSIM20912-H216

One unit	Two unit	
9	9+9	9+12
12		

6.2 Indoor unit combination for KSIM30912-H216

One unit	Two unit		Three unit	
9	9+9	9+12	9+9+9	9+9+12
12	12+12			

6.3 Indoor unit combination for KSIM40912-H216

One unit	Two unit		Three unit		Four Unit		
9	9+9	9+12	9+9+9	9+9+12	9+9+9+9	9+9+9+12	9+9+12+12
12	12+12		9+12+12	12+12+12			

7. Electronic control function

7.1 Abbreviation

T1: Indoor ambient temperature

T2: Coil temperature of indoor heat exchanger middle.

T2B: Coil temperature of indoor heat exchanger outlet.

T3: Coil temperature of outdoor heat exchanger

T4: Outdoor ambient temperature

T5: Compressor discharge temperature

Ts: Setting temp.

7.2 Electric control working environment.

7.2.1 Input voltage: 230V.
7.2.2 Input power frequency:60Hz.
7.2.3 Indoor fan normal working amp. is less than 1A.
7.2.4 Outdoor fan. Normal working amp. is less than 1.5A.
7.2.5 Four-way valve normal working amp. is less than 1A.
7.2.6 Swing motor: DC12V.

7.3 Outdoor unit's digital display tube

There is a digital display tube in outdoor PCB.

Digital display tube display function

- In standby , the LED displays "- -"
- In compressor operation, the LED display the running frequency,
- In defrosting mode, The LED displays "dF" or alternative displays between running frequency and "dF"(each displays 2s)
- In compressor pre-heating, The LED displays "- -"
- In protection or malfunction, the LED displays error code or protection code.

7.4 Outdoor unit point check function

There is a check switch in outdoor PCB.

Push the switch SW1 to check the states of unit when the unit is running. The digital display tube will display the follow procedure when push SW1 each time.

	Display	Remark
	Indoor unit capacity demand code	
	Outdoor unit running mode code	Off:0, Cooling:1, Heating:2
	Amendatory capacity demand code	
	Outdoor unit fan motor state	Off:0, Low speed:1, High speed:2
	Evaporator outlet temp. for 1# indoor unit	Actual data
	Evaporator outlet temp. for 2# indoor unit	Actual data
	Evaporator outlet temp. for 3# indoor unit	Actual data
	Evaporator outlet temp. for 4# indoor unit	Actual data
	Condenser pipe temp.	Actual data
	Ambient temp.	Actual data
	Compressor discharge temp.	Actual data
	Inverter current	Actual data
	EXV open angle for 1# indoor unit	Actual data divide 8

14	EXV open angle for 2# indoor unit	Actual data divide 8
15	EXV open angle for 3# indoor unit	Actual data divide 8
16	EXV open angle for 4# indoor unit	Actual data divide 8
17	Power supply of outdoor unit	AD data
18	Indoor unit number	The indoor unit can communicate with outdoor unit well.
19	The last error or protection code	00 means no malfunction
20	frequency value	Actual data
21	Ambient temp. of 1# indoor unit	Actual data
22	Condenser pipe temp. of 1# indoor unit	Actual data
23	Ambient temp. of 2# indoor unit	Actual data
24	Condenser pipe temp. of 2# indoor unit	Actual data
25	Ambient temp. of 3# indoor unit	Actual data
26	Condenser pipe temp. of 3# indoor unit	Actual data
27	Ambient temp. of 4# indoor unit	Actual data
28	Condenser pipe temp. of 4# indoor unit	Actual data
29	----	Check point over

The following items from 6.4.1 to 6.4.6 are for the explanation of the point check functions.

7.4.1 Frequency of compressor:

Display	Frequency of compressor (Hz)
30	30
--	Stand by
60	60

7.4.2 Running mode:

Display	Corresponding mode
0	Off
1	Cooling mode
2	Heating mode

7.4.3 Capacity demand:

Cooling mode

Capacity	2000-2500	2000-2500	3000-3800	4500-5000	5000-5500	5500-6100	6100-7000	7000-7500	7500-8000	>7500
Corresponding Code	1	2	3	4	5	6	7	8	9	>=10

Heating mode

Capacity	2000-2500	2000-2500	3000-3800	4500-5000	5500-6100	6100-7000	6100-7000	7000-7500	7500-8000	>8000
Corresponding Code	1	2	3	4	5	6	7	8	9-10	>=11

Note:

The capacity is just for reference.

7.4.4Number of indoor unit

Display	Number of indoor unit
1	1
2	2
3	3

7.4.5 Outdoor ambient temp:

Display	Corresponding temp.	Display	Corresponding temp.	Display	Corresponding temp.
15	-7.5	50	10	80	25
16	-7	51	10.5	81	25.5
17	-6.5	52	11	82	26
18	-6	53	11.5	83	26.5
19	-5.5	53	11.5	84	27
20	-5	54	12	85	27.5
21	-4.5	55	12.5	86	28
22	-4	56	13	87	28.5
23	-3.5	57	13.5	88	29
24	-3	58	14	89	29.5
26	-2	59	14.5	90	30
27	-1.5	60	15	91	30.5
28	-1	61	15.5	92	31
29	-0.5	62	16	93	31.5
30	0	63	16.5	93	31.5
31	0.5	63	16.5	94	32
32	1	64	17	95	32.5
33	1.5	65	17.5	96	33
34	2	65	17.5	97	33.5
35	2.5	66	18	98	34
36	3	67	18.5	99	34.5
37	3.5	68	19	10.	35~40
38	4	69	19.5	11.	40~45
39	4.5	70	20	12.	45~50
40	5	71	20.5	13.	50~55
41	5.5	72	21	14.	55~60
42	6	73	21.5	15.	60~65
43	6.5	74	22	16.	65~70
44	7	75	22.5		
45	7.5	75	22.5		
46	8	76	23		
47	8.5	77	23.5		
48	9	78	24		
49	9.5	79	24.5		

7.4.6 Opening degree of electronic expansion valve:

Actual opening degree equals the display data divided 8

7.5 Protection

7.5.1 Three minutes delay at restart for compressor.

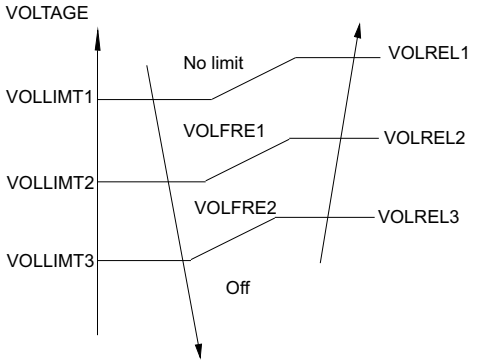
7.5.2 Temperature protection of compressor discharge.

When the compressor discharge temp. is getting higher, the running frequency will be limited as below rules:

----If 102 <T5<115 , decrease the frequency to the lower level every 2 minutes till to F1.

---If T5>115 for 10 seconds, the compressor will stop and restart till T5<90 .

7.5.3 Low voltage protection



Model	VOLLIMT1	VOLLIMT2	VOLLIMT3	VOLREL1	VOLREL2	VOLREL3	VOLFRE1	VOLFRE2
KSIM20912-H216	230	200	120	260	210	135	62	54
KSIM30912-H216	245	220	120	265	240	135	78	45
KSIM40912-H216	200	185	120	210	195	135	54	42

Note: if the low voltage protection occurs and not resumes within 3min, it will keep the protection always after restart the machine.

7.5.4 Compressor current limit protection

If the compressor current exceeds the current limit value for 10 seconds, the compressor frequency will be limited as below table.

Cooling mode:

Current frequency(Hz)	Current limit value(A)	Frequency limit
COOL_F10	ICOOLLMT6	Decrease the frequecny to COOL_F4 and run at COOL_F4 for 3 minutes. After that,the frequency will be adjusted according to the capacity demand and rise to the upper level every 3 minutes (When the frequency>COOL_F4 via capacity demand).
COOL_F9	ICOOLLMT5	
COOL_F8	ICOOLLMT4	
COOL_F7	ICOOLLMT3	
COOL_F6	ICOOLLMT2	
COOL_F5	ICOOLLMT1	
If the current frequency is lower than COOL_F4, the frequency will not be limited. After 10s of the compressor start, if the current>ICOOL,the AC will display the failure for 30 seconds and stop. The AC will restart 3 minutes later.		

Heating mode:

Current frequency(Hz)	Current limit value(A)	Frequency limit
HEAT_F12	IHEATLMT8	Decrease the frequency to HEAT_F4 and run at HEAT_F4 for 3 minutes. After that, the frequency will be adjusted according to the capacity demand and rise to the upper level every 3 minutes
HEAT_F11	IHEATLMT7	
HEAT_F10	IHEATLMT6	
HEAT_F9	IHEATLMT5	
HEAT_F8	IHEATLMT4	

HEAT_F7	IHEATLMT3	(When the frequency>Heat_F4 via capacity demand).
HEAT_F6	IHEATLMT2	
HEAT_F5	IHEATLMT1	
If the current frequency is lower than HEAT_F4, the frequency will not be limited. After 10s of the compressor start, if the current>IHEAT,the AC will display the failure for 30 seconds and stop. The AC will restart 3 minutes later.		

7.5.5 Indoor / outdoor units communication protection

If the indoor units can not receive the feedback signal from the outdoor units for 2 minutes, the AC will stop and display the failure.

7.5.6 High condenser coil temp. protection.

When T3>65 for 3 seconds, the compressor will stop while the indoor fan and outdoor fan will continue.

When T3<52 , the protection will release and the compressor will restart after 3 minutes.

7.5.7 Outdoor unit anti-freezing protection

When T2B<0 for 250 seconds, the indoor unit capacity demand will be zero and resume to normal when T2B>10 .

7.5.8 Oil return

Running rules:

1. If the compressor frequency keeps lower than RECOILINFRE for 2hours,the AC will rise the frequency to RECOILFRE for 3mins and then resume to former frequency.

Model	RECOILINFRE
KSIM20912-H216	45
KSIM30912-H216	45
KSIM40912-H216	40

2. During the oil return process, the EXV and indoor units keep the current running mode, the frequency will not be limited by the compressor discharge temp. and the current.

7.5.9 Compressor preheating functions

----Preheating permitting condition:

If T4(outdoor ambient temperature)＜3 and newly powered on or if T4＜3 and compressor has stopped for over 3 hours, the compressor heating cable will work.

----Preheating mode:

A weak current flow through the coil of compressor from the wiring terminal of compressor, then the compressor is heated without operation.

----Preheating release condition:

If T4＞5 or the compressor starts running, preheating function will stop.

7.5.10 Compressor crankcase heater

When T4<3 and the compressor is not running,the crankcase heater will be active.

When T4≧5 or the compressor starts up,the crankcase heater will stop work.

8. Troubleshooting

8.1 Indoor unit error code explanation:

Vertu series:

Display	LED STATUS
E0	EEPROM error
E1	Communication error between indoor and outdoor unit
E2	Zero-crossing examination error
E3	Fan speed beyond control
E5	Outdoor units temp. sensor or connector of temp. sensor is defective
E6	Indoor units temp. sensor or connector of temp. sensor is defective
P0	Inverter module protection
P1	Outdoor voltage too low protection
P2	Compressor discharge temp. protection
P3	Outdoor temp. too low protection
P4	Compressor driving protection

9A series:

NO.	MALFUNCTION	DEF	TIMER	AUTO	RUN	DISPLAY DIGITAL TUBE
1	EEPROM error	O	O	O	O	E0
2	Indoor / outdoor units communication protection	☆	☆	☆	☆	E1
3	Zero-crossing signal error	O	O	☆	☆	E2
4	Indoor fan speed out of control	O	O	☆	☆	E3
5	Outdoor unit temp. sensor or connector of temp. sensor is defective	X	O	X	☆	E5
6	Indoor units temp. sensor or connector of temp. sensor is defective	O	O	O	☆	E6
7	Outdoor fan speed out of control	☆	O	☆	☆	E7
8	IBM malfunction or IGBT over-strong current protection	X	X	O	☆	P0
9	Over voltage or too under voltage protection	X	O	O	☆	P1
10	Temperature protection of compressor top.	O	X	X	☆	P2
11	Compressor position protection	O	X	☆	☆	P4
12	Inverter module protection	X	O	☆	☆	P5

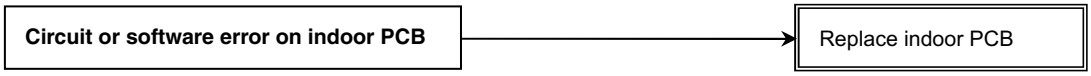
8.2 Outdoor unit error code explanation:

Display	LED STATUS
E0	EEPROM error
E1	No 1 Indoor units pipe temp. sensor or connector of pipe temp. sensor is defective
E2	No 2 Indoor units pipe temp. sensor or connector of pipe temp. sensor is defective
E3	No 3 Indoor units pipe temp. sensor or connector of pipe temp. sensor is defective
E6	No 4 Indoor units pipe temp. sensor or connector of pipe temp. sensor is defective
E4	Outdoor temp. sensor or connector of temp. sensor is defective
E5	Compressor volt protection
E7	Communication error between outdoor IC and DSP
P0	Compressor discharge temp. protection
P1	High pressure protection (just for 36K 1x4 units.)
P2	Low pressure protection (just for 36K 1x4 units.)
P3	Compressor current protection
P4	Inverter module protection
P5	Outdoor temp. too low protection
P6	Condenser high-temperature protection
P7	Compressor driving protection
PF	PFC protection (just for 36K 1x4 units.)

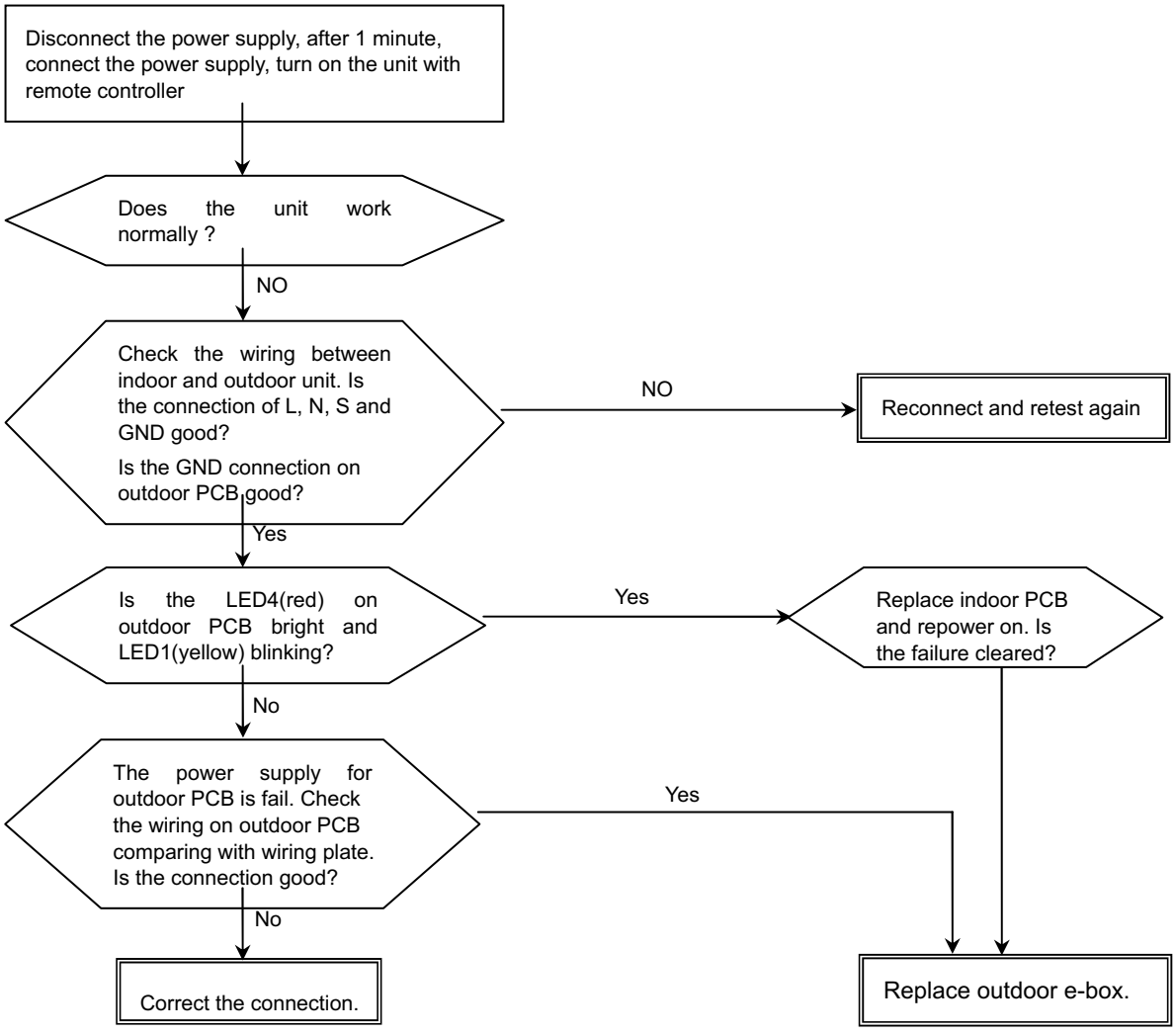
8.3 Trouble shooting

8.3.1 Indoor unit trouble shooting

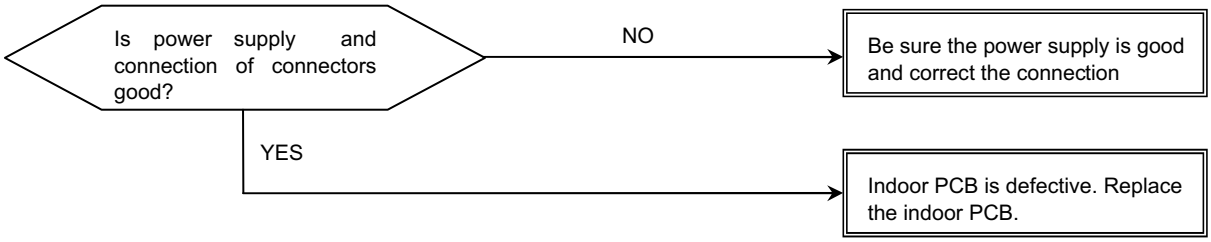
Indoor unit display	LED STATUS
E0	EEPROM error



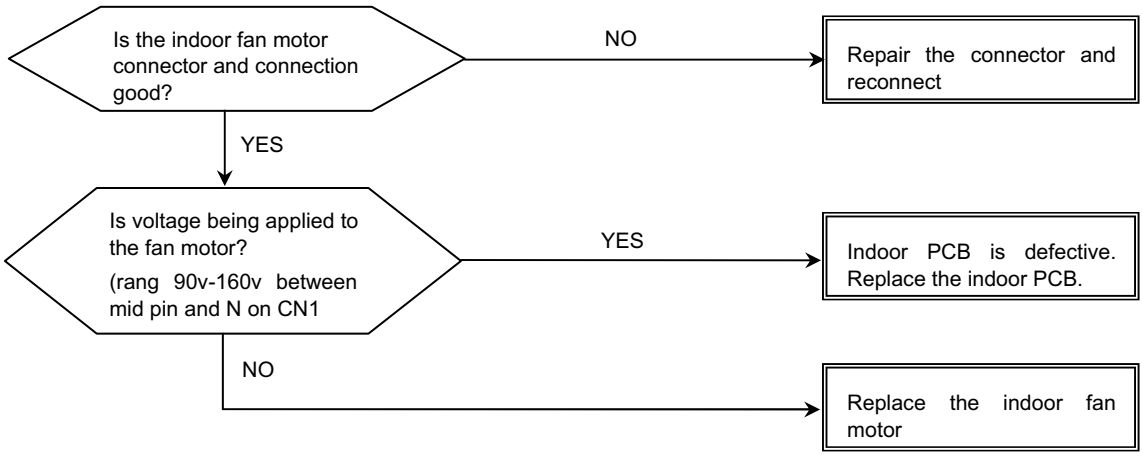
Indoor unit display	LED STATUS
E1	outdoor communication error


Disconnect the power supply, after 1 minute, connect the power supply, turn on the unit with remote controller
Does the unit work normally ?
NO
Check the wiring between indoor and outdoor unit. Is the connection of L, N, S and GND good?
Is the GND connection on outdoor PCB good?
NO
Reconnect and retest again
Yes
Is the LED4(red) on outdoor PCB bright and LED1(yellow) blinking?
Yes
Replace indoor PCB and repower on. Is the failure cleared?
No
The power supply for outdoor PCB is fail. Check the wiring on outdoor PCB comparing with wiring plate. Is the connection good?
Yes
No
Correct the connection.
Replace outdoor e-box.

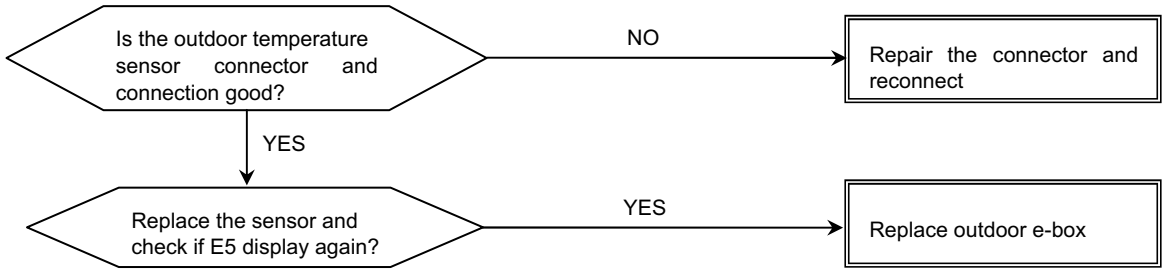
Indoor unit display	LED STATUS
E2	Zero-crossing examination error


Is power supply and connection of connectors good?
NO
Be sure the power supply is good and correct the connection
YES
Indoor PCB is defective. Replace the indoor PCB.

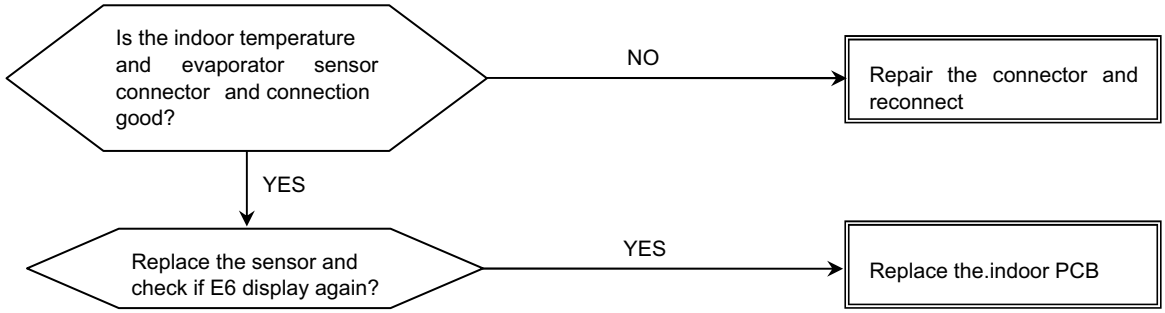
Indoor unit display	LED STATUS
E3	Fan speed beyond control


Is the indoor fan motor connector and connection good?
NO
Repair the connector and reconnect
YES
Is voltage being applied to the fan motor?
(rang 90v-160v between mid pin and N on CN1
YES
Indoor PCB is defective. Replace the indoor PCB.
NO
Replace the indoor fan motor

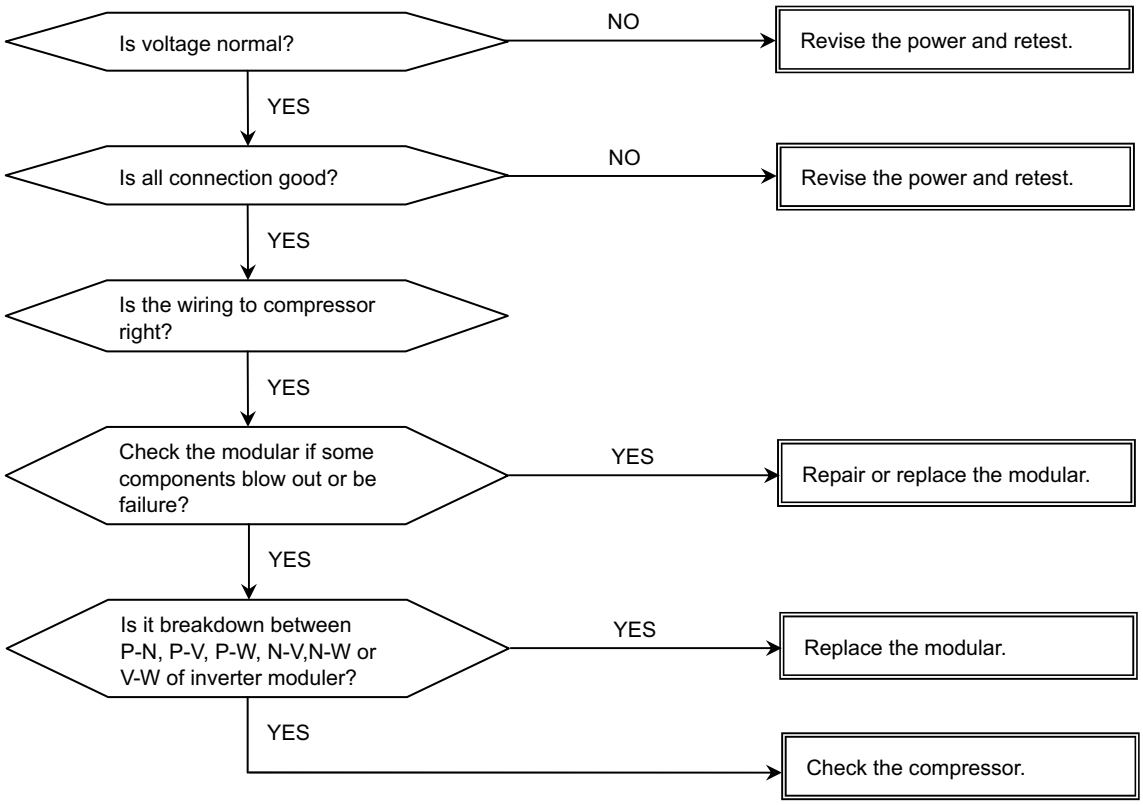
Indoor unit display	LED STATUS
E5	Outdoor units temp. sensor or connector of temp. sensor is defective


Is the outdoor temperature sensor connector and connection good?
NO
Repair the connector and reconnect
YES
Replace the sensor and check if E5 display again?
YES
Replace outdoor e-box

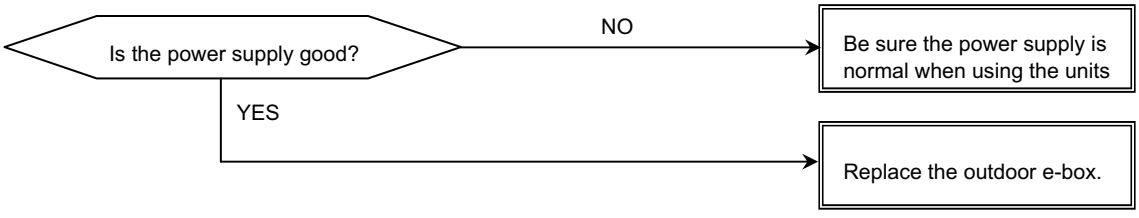
Indoor unit display	LED STATUS
E6	Indoor units temp. sensor or connector of temp. sensor is defective


Is the indoor temperature and evaporator sensor connector and connection good?
NO
Repair the connector and reconnect
YES
Replace the sensor and check if E6 display again?
YES
Replace the.indoor PCB

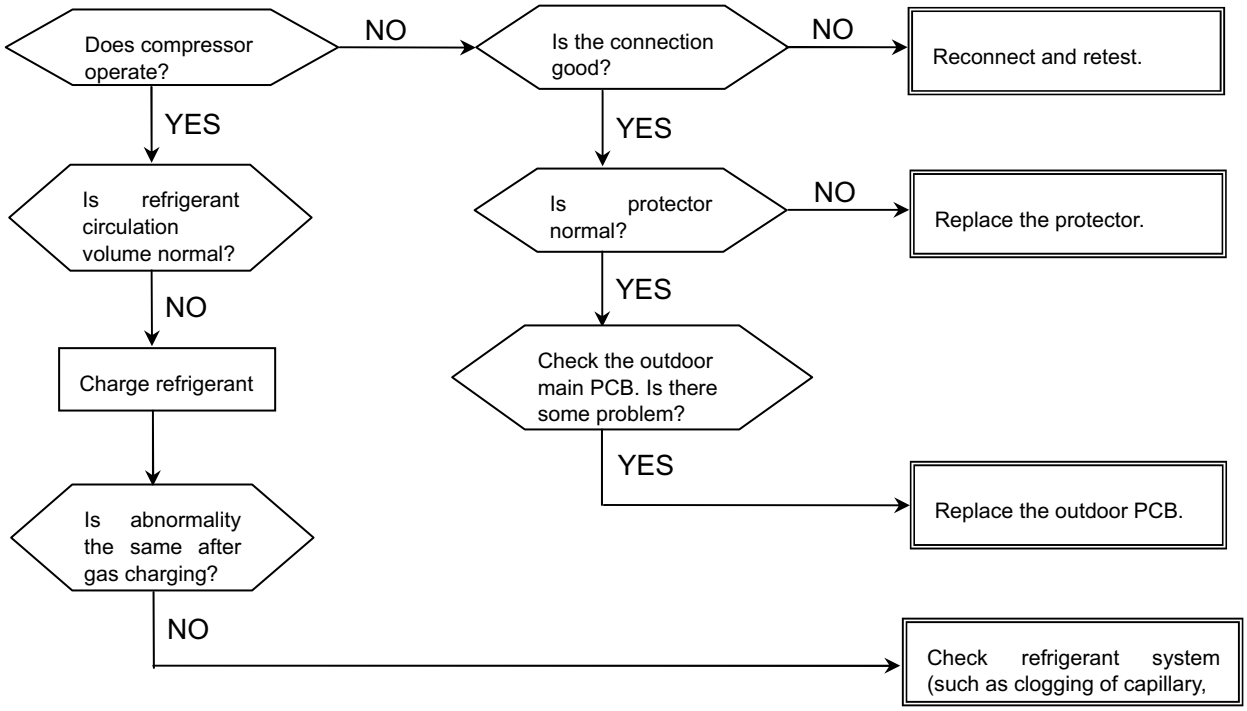
Indoor unit display	LED STATUS
P0	Inverter module protection



Indoor unit display	LED STATUS
P1	Outdoor voltage protection



Indoor unit display	LED STATUS
P2	Compressor top protection against temperature

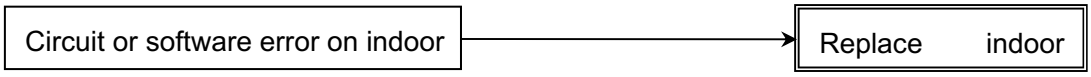


Indoor unit display	LED STATUS
P3	Compressor current protection

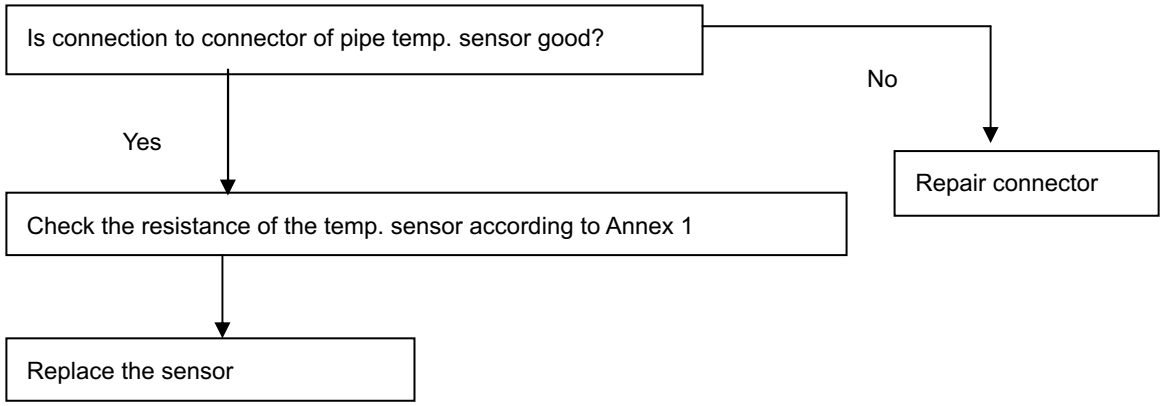
The trouble shooting is same with one of outdoor unit P3 protection.

8.3.2 Outdoor unit trouble shooting

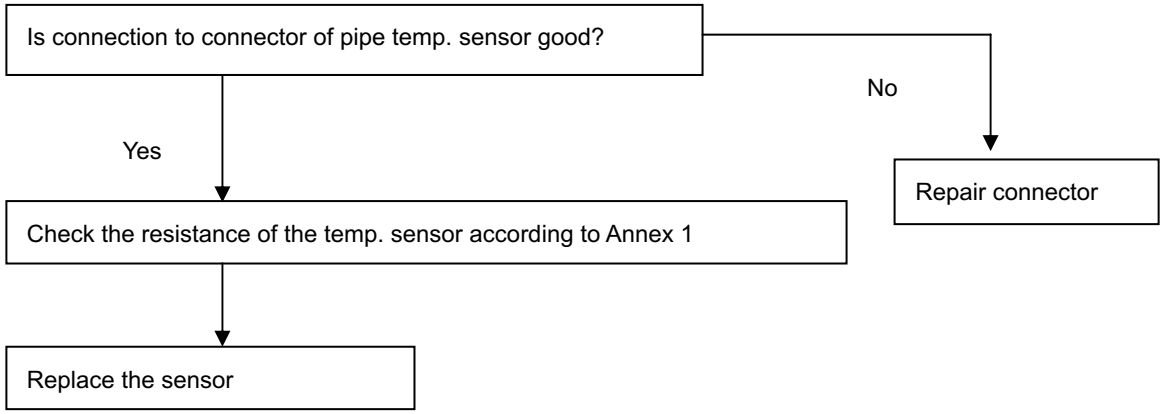
Outdoor unit display	LED STATUS
E0	EEPROM error



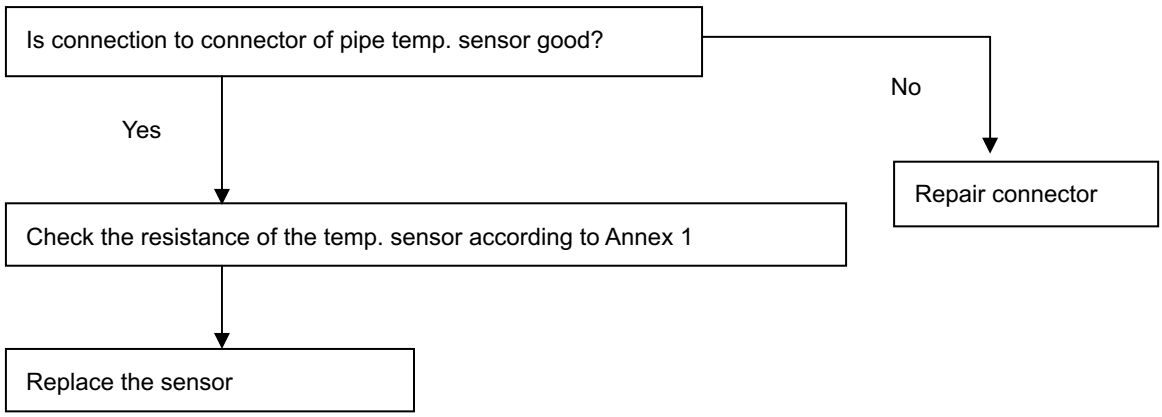
Outdoor unit display	LED STATUS
E1	No 1 Indoor units pipe temp. sensor or connector of pipe temp. sensor is defective


Is connection to connector of pipe temp. sensor good?
No
Yes
Repair connector
Check the resistance of the temp. sensor according to Annex 1
Replace the sensor

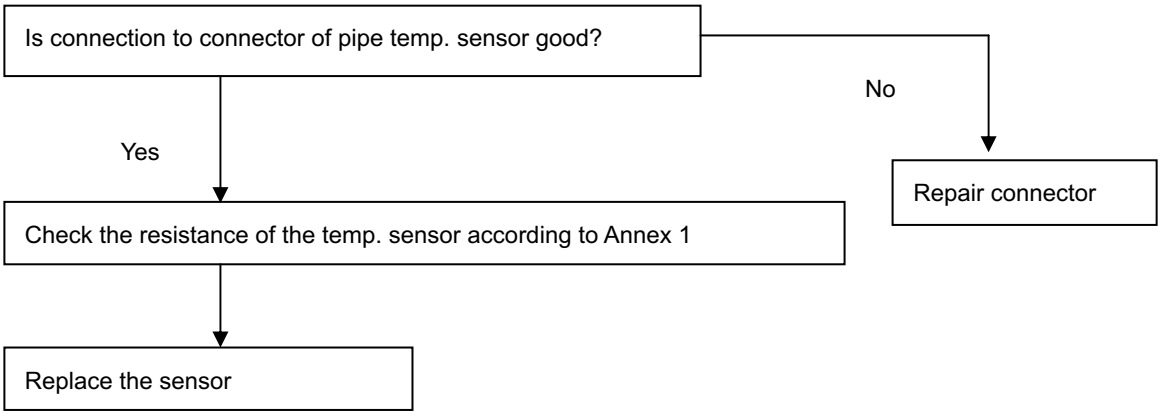
Outdoor unit display	LED STATUS
E2	No 2 Indoor units pipe temp. sensor or connector of pipe temp. sensor is defective


Is connection to connector of pipe temp. sensor good?
No
Yes
Repair connector
Check the resistance of the temp. sensor according to Annex 1
Replace the sensor

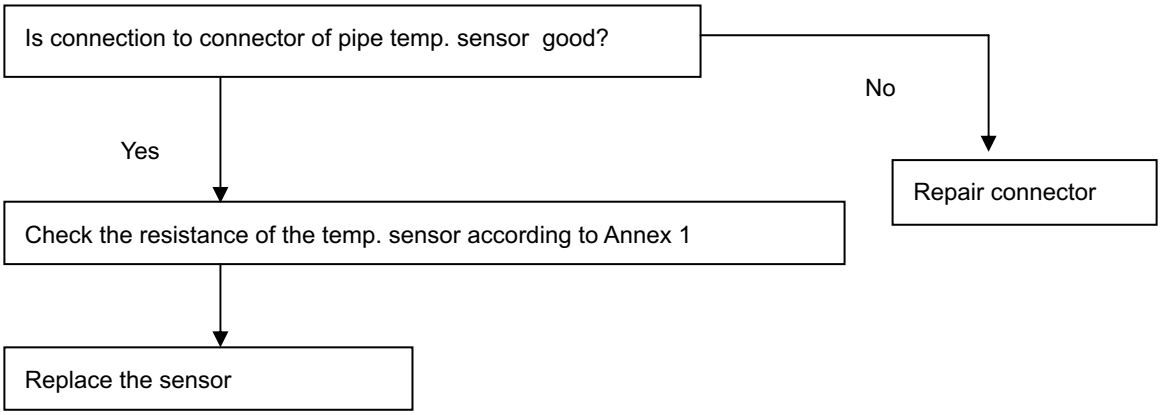
Outdoor unit display	LED STATUS
E3	No 3 Indoor units pipe temp. sensor or connector of pipe temp. sensor is defective


Is connection to connector of pipe temp. sensor good?
No
Yes
Repair connector
Check the resistance of the temp. sensor according to Annex 1
Replace the sensor

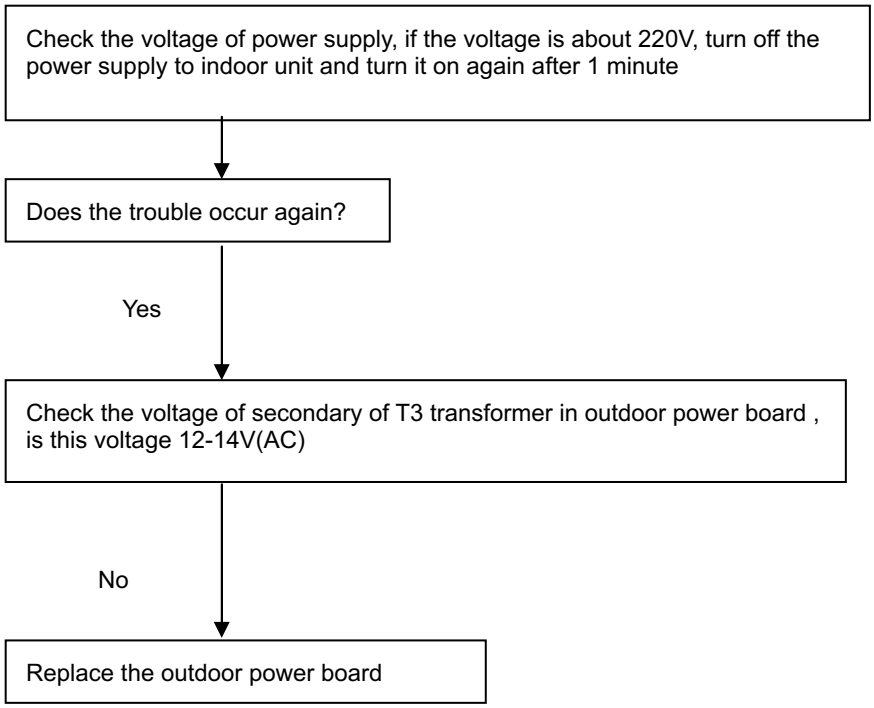
Outdoor unit display	LED STATUS
E6	No 4 Indoor units pipe temp. sensor or connector of pipe temp. sensor is defective


Is connection to connector of pipe temp. sensor good?
No
Yes
Repair connector
Check the resistance of the temp. sensor according to Annex 1
Replace the sensor

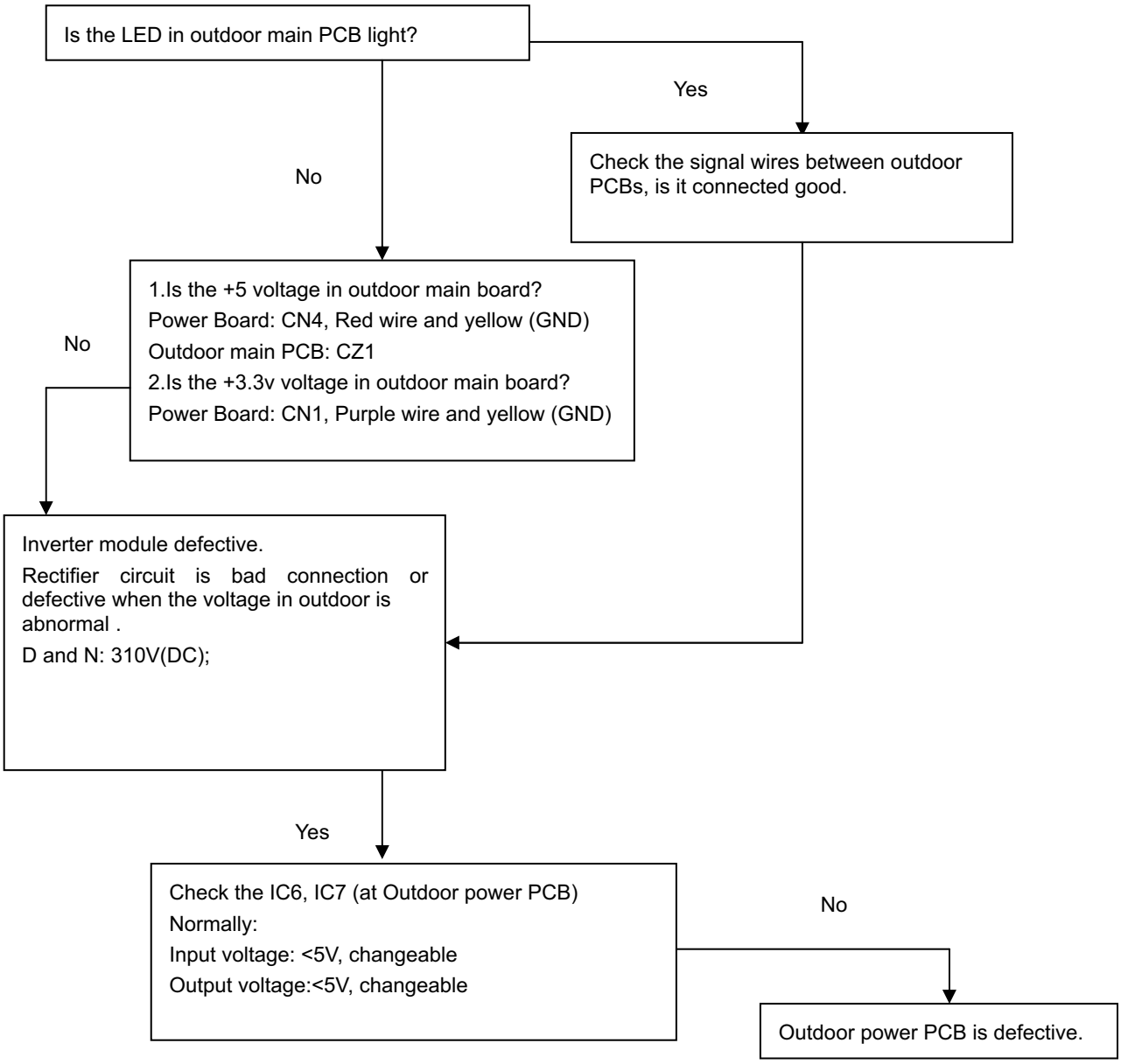
Outdoor unit display	LED STATUS
E4	Outdoor units temp. sensor or connector of temp. sensor is defective


Is connection to connector of pipe temp. sensor good?
No
Yes
Repair connector
Check the resistance of the temp. sensor according to Annex 1
Replace the sensor

Outdoor unit display	LED STATUS
E5	Compressor volt protection


Check the voltage of power supply, if the voltage is about 220V, turn off the power supply to indoor unit and turn it on again after 1 minute
Does the trouble occur again?
Yes
Check the voltage of secondary of T3 transformer in outdoor power board , is this voltage 12-14V(AC)
No
Replace the outdoor power board

Outdoor unit display	LED STATUS
E7	outdoor units communication protection

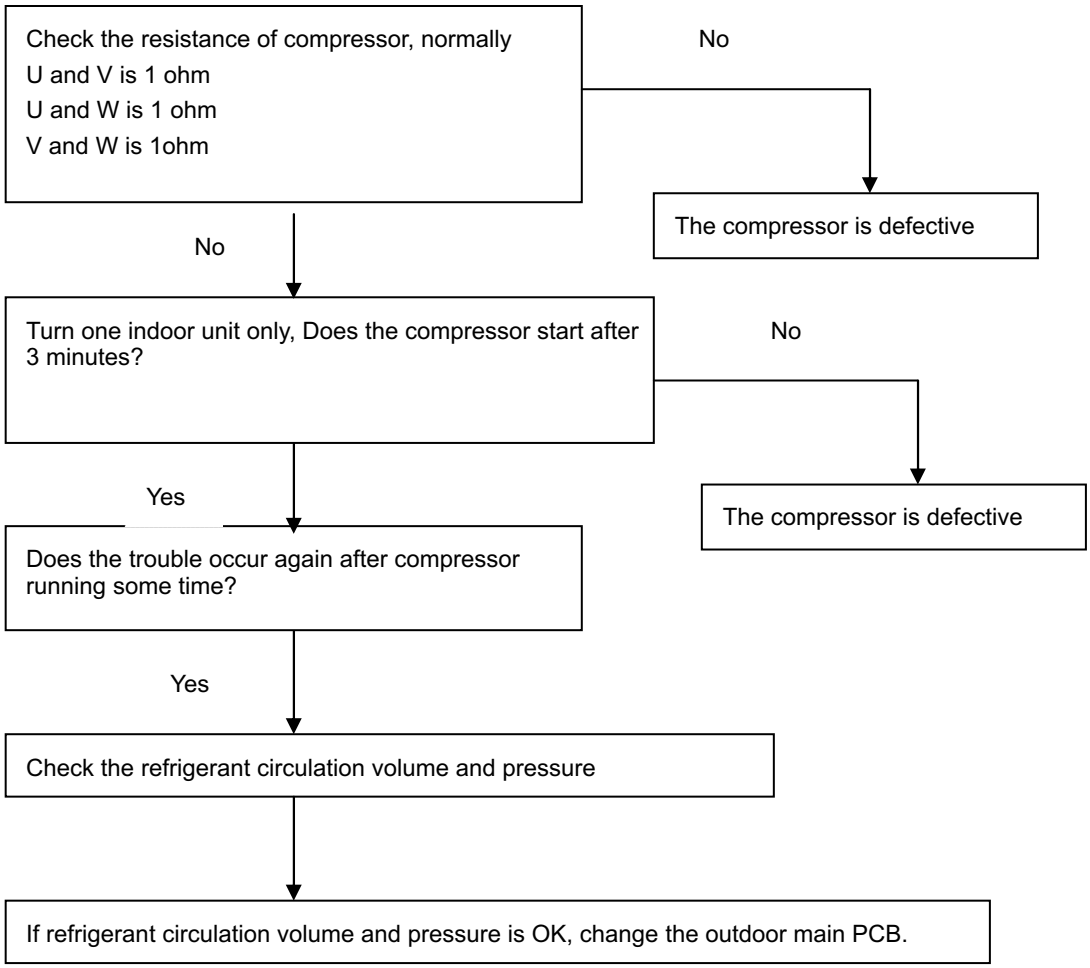

Is the LED in outdoor main PCB light?
Yes
No
Check the signal wires between outdoor PCBs, is it connected good.
1.Is the +5 voltage in outdoor main board?
Power Board: CN4, Red wire and yellow (GND)
Outdoor main PCB: CZ1
2.Is the +3.3v voltage in outdoor main board?
Power Board: CN1, Purple wire and yellow (GND)
No
Inverter module defective.
Rectifier circuit is bad connection or defective when the voltage in outdoor is abnormal .
D and N: 310V(DC);
Yes
Check the IC6, IC7 (at Outdoor power PCB)
Normally:
Input voltage: <5V, changeable
Output voltage:<5V, changeable
No
Outdoor power PCB is defective.

Outdoor unit display	LED STATUS
P0	Compressor top protection against temperature

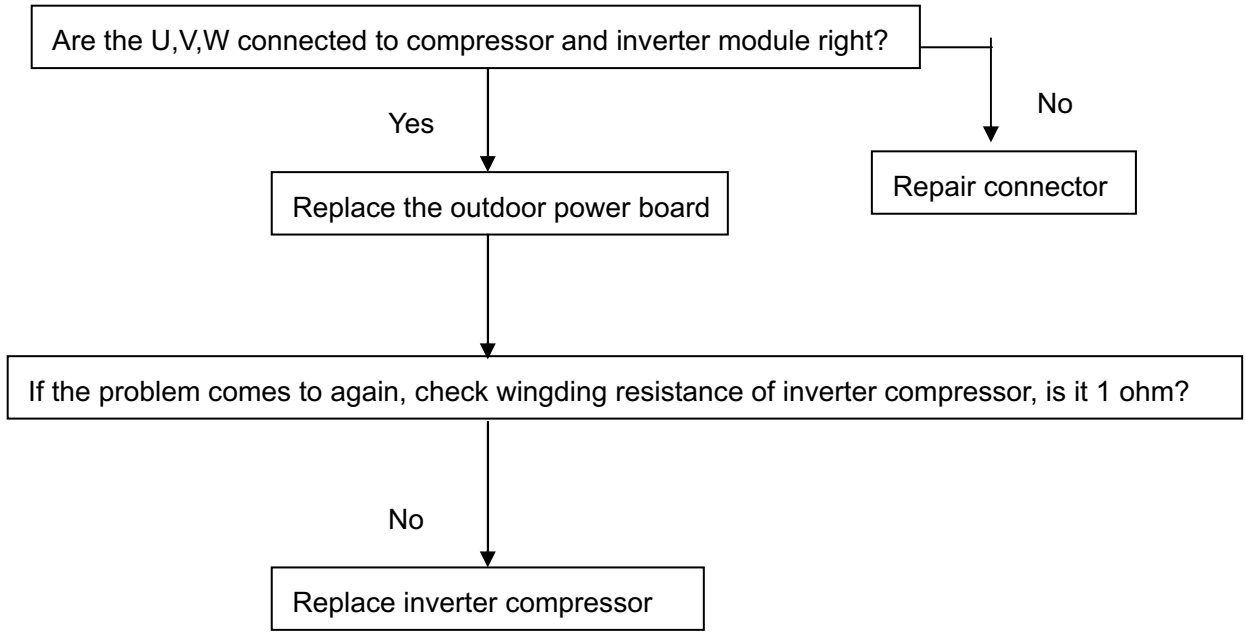
Off: 105c; On: 90c

The trouble shooting is same with the one of indoor unit P2 protection.

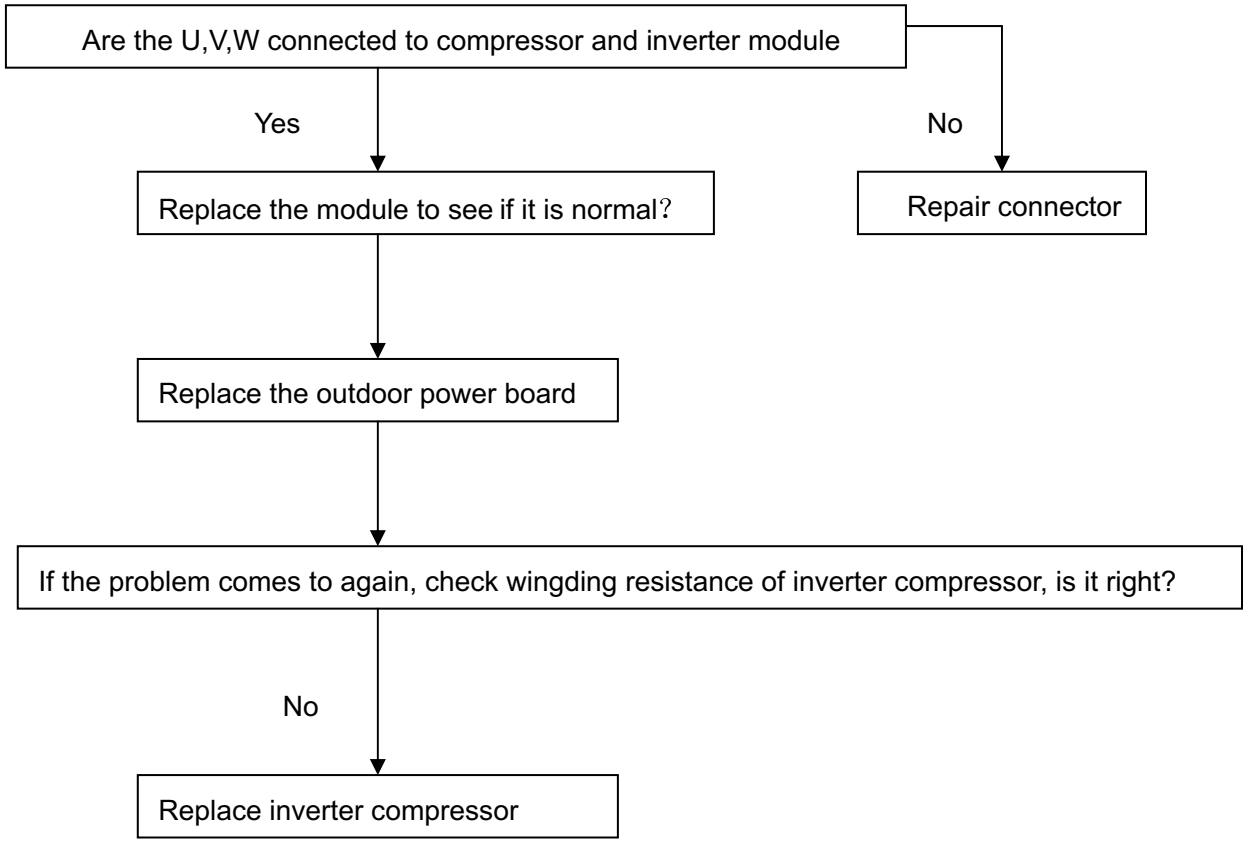
Outdoor unit display	LED STATUS
P3	Compressor current protection


Check the resistance of compressor, normally
U and V is 1 ohm
U and W is 1 ohm
V and W is 1ohm
No
The compressor is defective
No
Turn one indoor unit only, Does the compressor start after 3 minutes?
No
The compressor is defective
Yes
Does the trouble occur again after compressor running some time?
Yes
Check the refrigerant circulation volume and pressure
If refrigerant circulation volume and pressure is OK, change the outdoor main PCB.

Outdoor unit display	LED STATUS
P4	Compressor drive malfunction（drive protection arose）

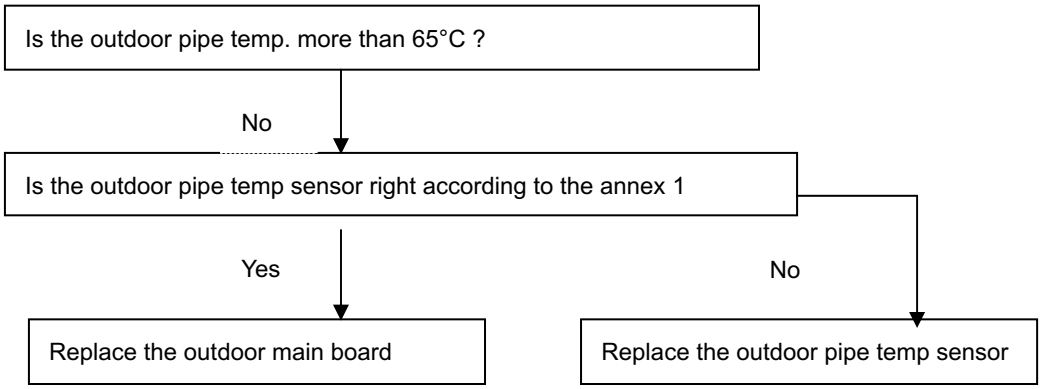

Are the U,V,W connected to compressor and inverter module right?
No
Repair connector
Yes
Replace the outdoor power board
If the problem comes to again, check wingding resistance of inverter compressor, is it 1 ohm?
No
Replace inverter compressor

Outdoor unit display	LED STATUS
P4(LED flashes for nine times)	Compressor drive malfunction（module protection arose）

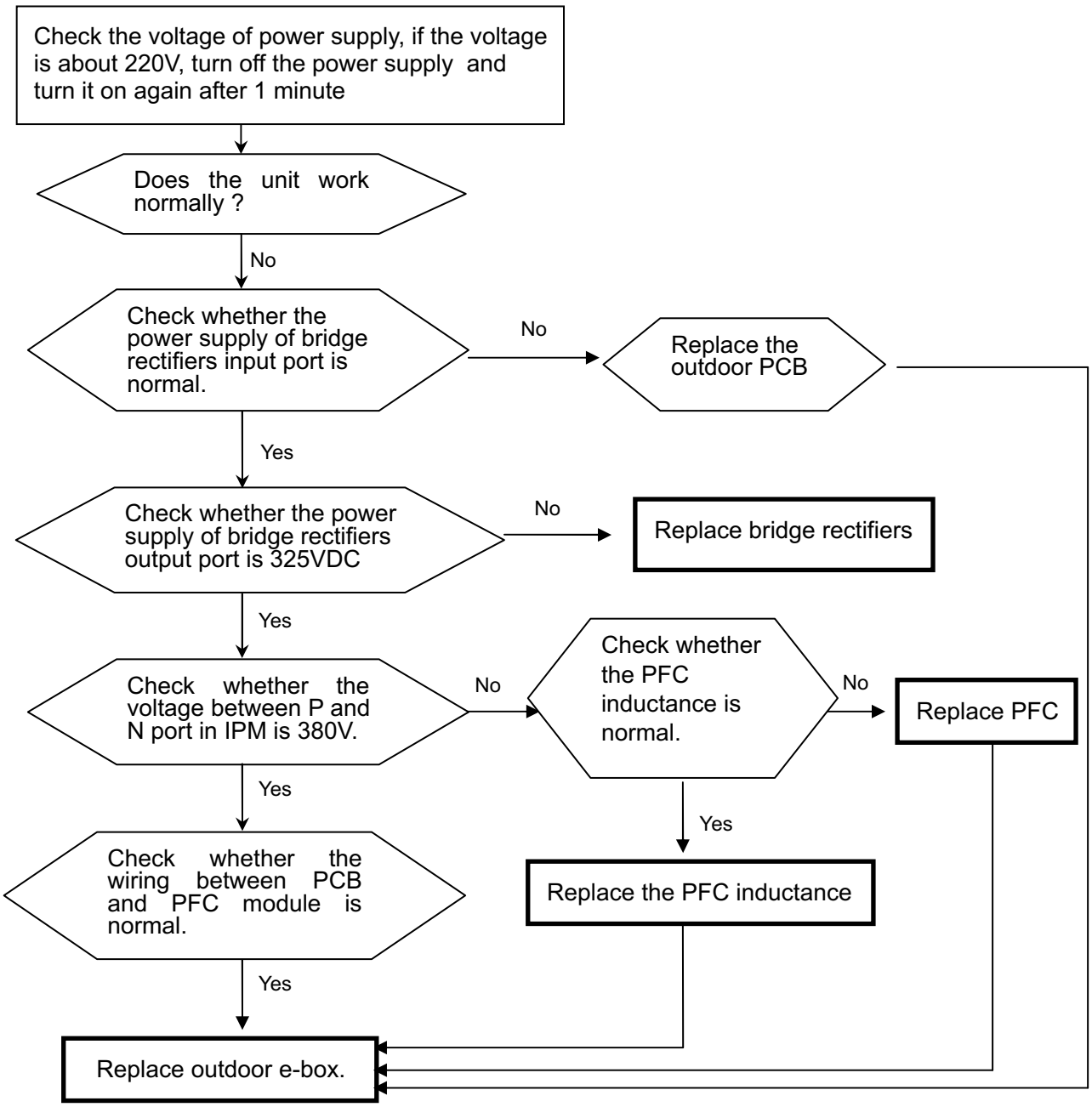

Are the U,V,W connected to compressor and inverter module
Yes
No
Repair connector
Replace the module to see if it is normal?
Replace the outdoor power board
If the problem comes to again, check wingding resistance of inverter compressor, is it right?
No
Replace inverter compressor

Outdoor unit display	LED STATUS
P6	Condenser high-temperature protection

When outdoor pipe temp. is more than 65°C, the unit will stop, and unit runs again when outdoor pipe temp. less than 52°C.


Is the outdoor pipe temp. more than 65°C ?
No
Is the outdoor pipe temp sensor right according to the annex 1
Yes
No
Replace the outdoor main board
Replace the outdoor pipe temp sensor

Outdoor unit display	LED STATUS
PF	PFC module protection


Check the voltage of power supply, if the voltage is about 220V, turn off the power supply and turn it on again after 1 minute
Does the unit work normally ?
No
Check whether the power supply of bridge rectifiers input port is normal.
No
Replace the outdoor PCB
Yes
Check whether the power supply of bridge rectifiers output port is 325VDC
No
Replace bridge rectifiers
Yes
Check whether the voltage between P and N port in IPM is 380V.
No
Check whether the PFC inductance is normal.
No
Replace PFC
Yes
Replace the PFC inductance
Yes
Check whether the wiring between PCB and PFC module is normal.
Yes
Replace outdoor e-box.

Annex 1

Characteristic of temp. sensor

Temp. ℃	Resistance K		Temp. ℃	Resistance K		Temp. ℃	Resistance K
-10	62.2756		17	14.6181		44	4.3874
-9	58.7079		18	13.918		45	4.2126
-8	56.3694		19	13.2631		46	4.0459
-7	52.2438		20	12.6431		47	3.8867
-6	49.3161		21	12.0561		48	3.7348
-5	46.5725		22	11.5		49	3.5896
-4	44		23	10.9731		50	3.451
-3	41.5878		24	10.4736		51	3.3185
-2	39.8239		25	10		52	3.1918
-1	37.1988		26	9.5507		53	3.0707

0	35.2024		27	9.1245		54	2.959
1	33.3269		28	8.7198		55	2.8442
2	31.5635		29	8.3357		56	2.7382
3	29.9058		30	7.9708		57	2.6368
4	28.3459		31	7.6241		58	2.5397
5	26.8778		32	7.2946		59	2.4468
6	25.4954		33	6.9814		60	2.3577
7	24.1932		34	6.6835		61	2.2725
8	22.5662		35	6.4002		62	2.1907
9	21.8094		36	6.1306		63	2.1124
10	20.7184		37	5.8736		64	2.0373
11	19.6891		38	5.6296		65	1.9653
12	18.7177		39	5.3969		66	1.8963
13	17.8005		40	5.1752		67	1.830
14	16.9341		41	4.9639		68	1.7665
15	16.1156		42	4.7625		69	1.7055
16	15.3418		43	4.5705		70	1.6469

Annex 2

1. Reference voltage data:

a) Rectifier : Input :220-230V(AC), output :310V(DC)

b) Inverter module: U,V, W 3ph.

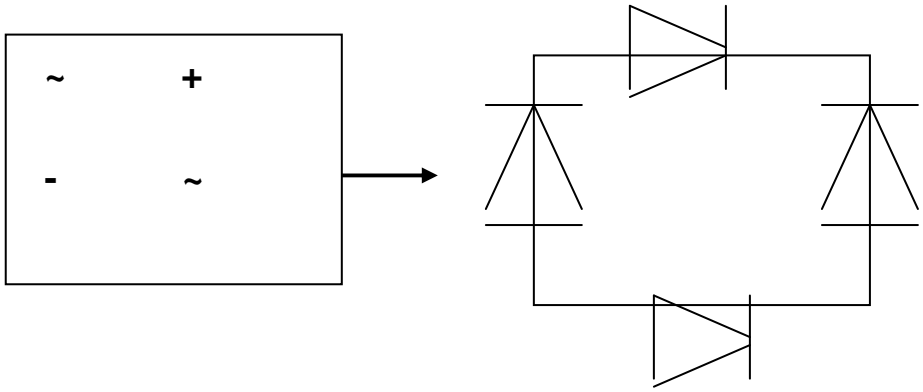
	Result
U-V	60-150V(AC)
U-W	60-150V(AC)
V-W	60-150V(AC)
P-N	DC 310V

c) Photo-couple PC817, PC851: Control side <+5V, AC side :< 24V(AC)

d) S terminal and N: changeable from 0-24V

2. Check the Diode Bridge component (In wiring diagram, rectifier)

Remark: If this part is abnormal, the LED will not light.



Multi-meter		Result	
		Forward Resistance	Backward Resistance
+	—	Infinite	Infinite
~	+	~500 ohm	Infinite
~			
-	~	~500 ohm	Infinite
	~		

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